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TITLE: Microspot test methods and field test kit for
on-site inspections of
chemical agents

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INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP
Novak; Thaddeus J.	Bel Air	MD	N/A
N/A			

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422/68.1 ; 436/162 ; 436/808

CLAIMS:

What is claimed is:

1. A method of detecting the presence of chemical warfare
agents, precursors and
degradation products thereof, consisting of:

contacting a liquid sample suspected of containing a member
of the group consisting
of chemical warfare agents, chemical warfare agent
precursors, chemical warfare
agent degradation products and mixtures thereof with a
sufficient amount of a
chromatographic adsorbent material and a sufficient amount
of a chromogenic
detector reagent, wherein said contacting comprises
applying said sample via a
microcapillary tube to said chromatographic adsorbent,

whereby a chromogenic indicator is formed when said sample
contains said member of
said group.

2. The method of claim 1, wherein said sample comprises a
solution.

3. The method of claim 1, wherein said contacting comprises reacting from about 0.1 to about 10 microliters of said sample with said chromatographic adsorbent material and said chromogenic detector reagent.

4. The method of claim 1, wherein said contacting comprises reacting from about 0.5 to about 5 microliters of said sample with said chromatographic adsorbent material and said chromogenic detector reagent.

5. The method of claim 1, wherein said contacting comprises reacting from about 1 to about 3 microliters of said sample with said chromatographic adsorbent material and said chromogenic detector reagent.

6. The method of claim 1, wherein said member is selected from the group consisting of ethyl N,N-dimethylphosphoramidocyanate (GA), isopropyl methylphosphonofluoridate (GB), pinacolyl methylphosphonofluoridate (GD), cyclohexyl methylphosphonofluoridate (GF), O-ethyl S-(2-diisopropylamino)ethyl methylphosphonothiolate (VX), bis(2-chloroethyl)sulfide (HID), bis[2-(2-chloroethylthio)ethyl]ether (T), 2-chlorovinylldichloroarsine (L), methylphosphonic difluoride (DF), ethyl 2-(diisopropylamino)ethyl methylphosphonite (QL), isopropyl methylphosphonic acid (IMPA), pinacolyl methylphosphonic acid (PMPA), cyclohexyl methylphosphonic acid (CMPA), methylphosphonofluoridic acid (MPFA), methylphosphonic dichloride (DC), S-(2-diisopropylamino)ethyl methylphosphonothioic acid (EA 2192), ethyl methylphosphonic acid (EMPA), O-ethyl methylphosphonothioic acid (EMPTA), 1,4-dithiane (DITHANE), 2-chlorovinylarsenious oxide (L-OXIDE) and methylphosphonic acid (MPA).

7. The method of claim 1, wherein said chromogenic detector reagent is selected from the group consisting of bromcresol green,

7,7,8,8-tetracyanoquinodimethane,
(TCNQ), gold chloride, gold chloride/ NaOH solution,
cholinesterase/indoxyl acetate,
4-(4'-nitrobenzyl) pyridine/NaOH, sodium pyrophosphate
peroxide/aromatic amine,
o-dianisidine/sodium perborate, potassium bismuth iodide,
1,3-diisonitrosoacetone
guanidinium salt, bis(diethylamino)benzophenone oxime,
bis(diethylamino)benzophenone,
bis(dimethylamino)thiobenzophenone, phenylazoformic
acid 2-diphenylhydrazide, diphenylcarbazone,
diphenylthiocarbazone, mercuric salt,
diethyldithiocarbamic acid silver salt,
2,2'-dithiobis(5-nitropyridine), molybdenum
oxide in sulfuric acid, ammonium molybdate, iodine/starch,
and sulfuric acid (4M).

8. The method of claim 1, wherein said microcapillary tube
has a cross-sectional
diameter of from about 0.05 to about 0.7 millimeters.

9. The method of claim 1, wherein said microcapillary tube
has a cross-sectional
diameter of from about 0.1 to about 0.4 millimeters.

10. The method of claim 1, wherein said microcapillary
tube has a cross-sectional
diameter of from about 0.2 to about 0.25 millimeters.

11. The method of claim 1, wherein said chromatographic
adsorbent material is a
thin layer chromatography plate.

12. The method of claim 11, wherein said thin layer
chromatography plate includes
adsorbent selected from the group consisting of silica gel
and alumina.

13. The method of claim 11, wherein said thin layer
chromatography plate includes
backing material selected from the group consisting of
glass, plastic and aluminum.

14. A kit for chromogenically detecting the presence of
chemical warfare agents and
degradation products thereof, consisting of:

(a) microcapillary tube means for applying a liquid sample

suspected of containing
a member of the group consisting of chemical warfare
agents, precursors and chemical
warfare agent degradation products and mixtures thereof;

(b) a sufficient amount of a chromatographic adsorbent
material; and

(c) a sufficient amount of a chromogenic detector reagent.

15. The kit of claim 14, wherein said member is selected
from the group consisting
of ethyl N,N-dimethylphosphoramidocyanate (GA), isopropyl
methylphosphonofluoridate
(GB), pinacolyl methylphosphonofluoridate (GD), cyclohexyl
methylphosphonofluoridate
(GF), O-ethyl S-(2-diisopropylamino)ethyl
methylphosphonothiolate (VX),
bis(2-chloroethyl)sulfide (HD),
bis[2-(2-chloroethylthio)ethyl] ether (T),
2-chlorovinylldichloroarsine (L), methylphosphonic
difluoride (DF), ethyl
2-(diisopropylamino)ethyl methylphosphonite (QL), isopropyl
methylphosphonic acid
(IMPA), pinacolyl methylphosphonic acid (PMPA), cyclohexyl
methylphosphonic acid
(CMPA), methylphosphonofluoridic acid (MPFA),
methylphosphonic dichloride (DC),
S-(2-diisopropylamino)ethyl methylphosphonothioic acid (EA
2192), ethyl
methylphosphonic acid (EMPA), O-ethyl methylphosphonothioic
acid (EMPTA),
1,4-dithiane (DITHIANE), 2-chlorovinylarsenious oxide
(L-OXIDE) and methylphosphonic
acid (MPA).

16. The kit of claim 15, wherein said chromogenic detector
reagent is selected from
the group consisting of bromcresol green,
7,7,8,8-tetracyanoquinodimethane, (TCNQ),
gold chloride, gold chloride/ NaOH solution,
cholinesterase/indoxyl acetate,
4-(4'-nitrobenzyl) pyridine/NaOH, sodium pyrophosphate
peroxide/aromatic amine,
o-dianisidine/sodium perborate, potassium bismuth iodide,
1,3-diisonitrosoacetone
guanidinium salt, bis(diethylamino)benzophenone oxime,
bis(diethylamino)benzophenone,

bis(dimethylamino)thiobenzophenone, phenylazoformic acid 2-diphenylhydrazide, diphenylcarbazone, diphenylthiocarbazone, mercuric salt, diethyldithiocarbamic acid silver salt, 2,2'-dithiobis(5-nitropyridine), molybdenum oxide in sulfuric acid, ammonium molybdate, iodine/starch, and sulfuric acid (4M).

17. The kit of claim 4, wherein said chromatographic adsorbent material is a thin layer chromatography plate.

18. The kit of claim 17, wherein said thin layer chromatography plate includes adsorbent material selected from the group consisting of silica gel and alumina.

19. The kit of claim 17, wherein said thin layer chromatography plate includes backing material selected from the group consisting of glass, plastic, or aluminum.

20. The kit of claim 4, wherein said means for obtaining a sample comprises a capillary tube.

21. The kit of claim 20, wherein said microcapillary tube has a cross-sectional diameter of from about 0.05 to about 0.7 millimeters.

22. The kit of claim 20, wherein said microcapillary tube has a cross-sectional diameter of from about 0.1 to about 0.4 millimeters.

23. The kit of claim 20, wherein said microcapillary tube has a cross-sectional diameter of from about 0.2 to about 0.25 millimeters.

24. The kit of claim 21, wherein said microcapillary tube is capable of delivering from about 0.1 to about 10 microliters of said sample.

25. The kit of claim 22, wherein said microcapillary tube is capable of delivering from about 0.5 to about 5 microliters of said sample.

26. The kit of claim 23, wherein said microcapillary tube is capable of delivering

from about 1 to about 3 microliters of said sample.